ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603801A Aviation - Advanced Development

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	14869	11404	5746	5870	9130	9485	10324	10448	Continuing	Continuing
DB32 Advanced Maintenance Concepts and Equipment	3606	2592	2990	3046	3441	3573	3836	3949	Continuing	Continuing
DB33 Cargo Handling and Mission Support Equipment	1810	2384	2756	2824	3003	3219	3541	3556	Continuing	Continuing
DB45 Aircrew Integrated Systems - Advanced Development	9453	6428	0	0	2686	2693	2947	2943	Continuing	Continuing

A. Mission Description and Budget Item Justification: This PE provides advanced development aviation support of tactical programs associated with air mobility, advanced maintenance concepts and equipment, and Aircrew Integrated Systems (ACIS).

B. Program Change Summary	FY 1998	FY 1999	FY 2000	FY 2001
Previous President's Budget (FY 1999 PB)	13696	7487	5872	5993
Appropriated Value	14132	11487		
Adjustments to Appropriated Value				
a. Congressional General Reductions	-436	-83		
b. SBIR / STTR	-331			
c. Omnibus or Other Above Threshold Reductions	-109			
d. Below Threshold Reprogramming	+1613			
e. Rescissions				
Adjustments to Budget Years Since FY 1999 PB			-126	-123
Current Budget Submit (FY 2000 / 2001 PB)	14869	11404	5746	5870

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603801A Aviation - Advanced Development

PROJECT: DB32

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
DB32 Advanced Maintenance Concepts and Equipment	3606	2592	2990	3046	3441	3573	3836	3949	Continuing	Continuing

A. Mission Description and Budget Item Justification: This project enhances utilization of current and future aircraft by improving the efficiency of maintenance (primarily in the area of diagnostics/prognostics) and servicing operations by validating new maintenance concepts to improve man machine interface, enhancing aircraft maintenance procedures and reducing operating and support costs. Included in the project are Digitized Aviation Logistics (DAL) elements such as: Portable Maintenance Aids (PMA), database management software, on-board diagnostics, digital source collector, health/usage monitoring system, trending analysis, and support infrastructure.

FY 1998 Accomplishments:

- 617 Completed the critical design review, prototype build and demonstration of advanced maintenance software tools to be hosted on a Portable Maintenance Aid. These tools include the application of digitized drawings, flexible maintenance scheduling and integration of aircrew information into the diagnostic process.
- 150 Conducted engineering assessment of MH-47D flight loads data as integrity test of Structural Usage Monitoring System (SUMS) for the MH-47E. This was a limited proof of concept activity for infrastructure implementation of on-board data recording and use.
- 175 Analyzed system needs and developed technology insertion road maps for on-board diagnostics and monitoring functions for the modernized fleet
- 2664 Completed an analysis and detailed planning effort for a prototype program to implement an enterprise infrastructure for digitized aviation logistics (DALP), concentrating on unit maintenance and engineering sustainment needs. Performed a cost/benefit analysis as part of the prioritization and tradeoff process. Identified and coordinated technical and programmatic interfaces with numerous critical DoD and industry efforts to include the Global Combat Support System – Army (GCSS-Army). The prototype includes elements of the Aviation Logistics Concept for Force XXI at each level of activity; on-aircraft, at-aircraft, at-unit, above-unit, and the sustainment base.

Total 3606

FY 1999 Planned Program:

- 900 Design, develop, select, and/or integrate on-aircraft technologies and capabilities necessary to support the front-end information requirements of the DALP. This includes supplemental diagnostics, rotor track and balance, usage monitors, exceedance monitors, automatic identification technology, and digital data/information collection and on-board processing capability necessary to achieve the DALP goals.
- 636 Expand at-aircraft software tools to provide data download, transport, and integration of on-board information with diagnostic, repair, and replace technical reference information to enable single point access for the maintainer.
- 675 Integrate at-unit maintenance management and decision support software with the on-board system and at-aircraft maintenance action data to enable higher levels of planning, diagnosis, and decisions. Interface aviation specific functions with the GCSS-Army information management infrastructure.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603801A Aviation - Advanced Development
	PROJECT DB32

FY 1999 Planned Program: (continued)

- 330 Support above-unit and sustainment base data distribution, analysis and decision support for maintenance inspection, procedure, and criteria improvements.
- 51 Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs.

Total 2592

FY 2000 Planned Program:

- 800 Initiate implementation of on-aircraft technologies and begin field data collection and distribution
- 740 Develop and integrate software components of prototype portable maintenance aid sufficient to enable field data transport and limited database integration.
- 1020 Develop and integrate software components of prototype at-unit maintenance management system capable of performing usage tracking, trending, scheduled and unscheduled inspection and repair planning, and configuration management. System will also provide limited interface with GCSS-Army functionality.
- 430 Evaluate engineering change decision impact on real-time unit maintenance actions and implement streamlined support process to advance toward on-condition maintenance.

Total 2990

FY 2001 Planned Program:

- 1459 Conduct company/battalion field operations using prototype digital logistics infrastructure. Collect, analyze, and use data to make changes in the decisions we make and actions we take in operating and supporting the aircraft.
- 871 Provide single point access for the maintainer for information needs. Integrate software and promote automatic information exchange between databases.
- 716 Evaluate functionality for configuration management, flexible maintenance inspection and repair scheduling, on-condition maintenance, and integrated information management systems.

Total 3046

B. Other Program Funding Summary: None

C. Acquisition Strategy: This project is an aggregate of advanced maintenance concepts-related projects. While the detailed acquisition strategy varies from project to project, the general strategy for each individual project is to complete the development effort through Government test (developmental and operational). Program documentation for milestone decision is prepared, as appropriate, concurrently with the development effort in preparation for program transition to the organization responsible for production and fielding.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603801A Aviation - Advanced Development

PROJECT: DB32

D. Schedule Profile	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Digital Aviation Logistics Prototype									
Define digital aviation logistics vision	4Qtr								
Conduct cost/benefit tradeoffs		4Qtr							
Developed detailed prototype plan		4Qtr							
Select Specific On-Board Technologies			4Qtr						
Initiate On-Aircraft integration			4Qtr						
Prototype Portable Maintenance Aid				4Qtr					
Automate integrated database transfer				4Qtr					
Interface information management systems			4Qtr	4Qtr					
Begin field data collection				4Qtr					
Evaluate on-condition maintenance structure					4Qtr				
Conduct company/battalion operations					4Qtr				
Evaluate results and adjust infrastructure					4Qtr				

ARMY RDT&E COST ANALYSIS (R-3)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603801A Aviation - Advanced Development

PROJECT: DB32

I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	FY 2001 Cost	FY 2001 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a. On-Board Systems	SS/CPFF	TBD		950	3rd Qtr	800					1750	1350
b. At-aircraft Systems	C/CPFF	TBD		637	2nd Qtr	740		871			2248	1500
c. At-Unit Systems	C/CPFF	TBD		675	3rd Qtr	1020		716			2411	1700
d. Above-Unit Systems	C/CPFF	TBD		330	4th Qtr	430					760	350
e. DALP Demo	C/CPFF	TBD		0		0		1459			1459	1459
Subtotal Product Development:				2592		2990		3046			8628	

II. Support Costs: None

III. Test and Evaluation: None

IV. Management Services: None

Project Total Cost:				2592		2990		3046			8628	

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603801A Aviation - Advanced Development PROJECT DB33

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
DB33 Cargo Handling and Mission Support Equipment	1810	2384	2756	2824	3003	3219	3541	3556	Continuing	Continuing

A. Mission Description and Budget Item Justification: This project develops equipment, practices, and procedures for the operational improvement of planning, loading, transport, and off-loading of helicopter cargo in all-weather, around the clock combat scenarios. It also replaces obsolete and insupportable ground support equipment with new and standardized multi-output equipment compatible with all Army aircraft models; develops rapid battle repair procedures and tools to speed the return of aircraft to combat ready status; and develops new equipment for aerial recovery of damaged aircraft.

FY 1998 Accomplishments:

- 165 Developed vehicle generator and initiated development of power electronics for multi-mode electric power source for aviation contact maintenance operations (contact maintenance electrical power (CMEP)).
- 933 Initiated definition of engine/aircraft-interface, expert diagnostic logic for the force modernization aviation fleet engines and auxiliary power units to support FY99 development of aviation turbine engine diagnostic system (ATEDS)
- 185 Completed non-developmental item competition and selection and began fabrication of objective aircraft cleaning and deicing system (ACDS) that is intended to provide aviation with a mobile, environmentally compliant cleaning and deicing capability
- 225 Building on highly successful prototype effort, initiated development of field hardened computer aided nondestructive inspection and disposition (CANDID) system to meet joint service (Army/Navy) nondestructive inspection requirements for both metal and composite aircraft structures
- 75 Investigated alternative environmentally friendly aircraft deicing technologies for future deicing system applications
- 227 Developed and tested structural changes to accommodate tie-down of internal fuel tanks in the advanced cargo handling system (ACHS I) (composite floor, flip over rollers, pallet/vehicle guides and locks). Installing the modified ACHS in a National Guard aircraft for further evaluation.

Total 1810

FY 1999 Planned Program:

- 784 Complete the expert engine/aircraft-interface diagnostic databases, and initiate development of ATEDS for the force modernized fleet
- 584 Identify performance requirements and initiate design of replacement for Aviation Ground Power Unit (AGPU) to meet the needs of the force modernized fleet
- 260 Complete preliminary design of objective CANDID system, identifying hardware, software, and packaging requirements
- 216 Complete installation of ACHS in National Guard aircraft. Resolve interface issues with ACHS and internal fuel tanks. Perform system upgrades to a production configuration. Conduct qualification testing of ACHS subsystems.
- 243 Initiate effort to detect, characterize, treat, and prevent hidden corrosion in aircraft structures; building on detection capability being developed under the CANDID effort and the Navy's ongoing treatment and prevention activities

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603801A Aviation - Advanced Development
	PROJECT DB33

FY 1999 Planned Program: (continued)

- 201 Fabricate 4 objective ACDS prototypes and conduct laboratory and field tests
- 50 Complete CMEP power electronics, complete vehicle installation kit, install in prototype vehicle, and field test
- 46 Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs.

Total 2384

FY 2000 Planned Program:

- 100 Complete field testing of ACDS prototype units in joint service field environments
- 450 Complete detail design of CANDID hardware and software, and fabricate 5 prototype systems
- 500 Complete detail design of AGPU replacement prototype system and initiate fabrication of prototype
- 316 Expand ACHS I efforts to meet identified deficiencies through initiation of additional technology development (ACHS II) in the areas of remote external cargo monitoring, high capacity external cargo winches, and automated weight and balance subsystems
- 579 Complete detail design of ATEDS hardware and software and initiate fabrication of prototype hardware
- 519 Identify most promising corrosion treatment and prevention technologies, concentrating on field application and initiate detail design efforts. Characterize structural degradation as function of hidden corrosion detection.
- 292 Building on prior combat maintenance/battle damage repair efforts, initiate development of low observable component battle damage repair (LOBDR) kit(s).

Total 2756

FY 2001 Planned Program:

- 195 Complete field testing of prototype CANDID systems and develop product/performance specification for follow on procurement
- 585 Fabricate 2 AGPU replacement prototypes and initiate field test
- 325 Complete detail design of ACHS II subsystems and fabrication of prototype hardware. Install in testbed aircraft for field evaluation
- 585 Complete fabrication of ATEDS prototypes and complete field evaluation
- 684 Complete detail design efforts, fabrication, and application of corrosion technologies, as necessary, and conduct field evaluation. Modify maintenance inspection and repair criteria in accordance with structural degradation characterization
- 450 Complete detail design of LOBDR kit(s) and initiate fabrication of kit(s)

Total 2824

B. <u>Other Program Funding Summary</u>: None

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603801A Aviation - Advanced Development
	PROJECT DB33

C. Acquisition Strategy: This project is an aggregate of advanced mission support and cargo handling concepts-related projects. While the detailed acquisition strategy varies from project to project, the general strategy for each individual project is to complete the development effort through Government test (developmental and operational). Program documentation for milestone decisions is prepared, as appropriate, concurrently with the development effort in preparation for program transition to the organization responsible for production and fielding.

D. Schedule Profile	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contact Maintenance Electrical Power (CMEP)								
Preliminary Design Review	4Qtr							
Detailed Design Review		2Qtr						
Fabrication (1)		3Qtr						
Test		4Qtr						
Aviation Turbine Engine Diagnostic Sys (ATEDS)								
Complete database development		2 Qtr						
Preliminary Design Review		3 Qtr						
Detailed Design Review			3Qtr					
Fabrication (3)			4 Qtr					
Test				4Qtr				
Aircraft Cleaning and Deicing System (ACDS)								
Preliminary Design Review	4Qtr							
Fabrication (4)		3Qtr						
Test			1Qtr					
Computer Aided Non-Destructive Inspection and Disposition (CANDID) System								
Preliminary Design Review		3Qtr						
Detailed Design Review			1Qtr					
Fabrication (5)			3Qtr					
Test				4Qtr				
AGPU Replacement								
Preliminary Design Review		4Qtr						
Detailed Design Review			1Qtr					
Fabrication (2)				1Qtr				

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603801A Aviation - Advanced Development

PROJECT: DB33

D. Schedule Profile	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Advanced Cargo Handling System (ACHS)								
Phase I Test								
Phase 2 Preliminary Design Review				4 Qtr				
Phase 2 Detailed Design					4 Qtr			
Fabrication (1)						4 Qtr		
Test						r	4 Qtr	
Corrosion Detection, Characterization, Prevention, & Treatment								
Preliminary Design Review			4Qtr					
Detailed Design Review			4Qtr					
Fabrication				4Qtr				
Test				4Qtr				
Low Observable Battle Damage Repair (LOBDR)								
Preliminary Design Review			4Qtr					
Detailed Design Review				4Qtr				
Fabrication					4Qtr			
Test						4Qtr		

ARMY RDT&E COST ANALYSIS (R-3)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603801A Aviation - Advanced Development

PROJECT: DB33

I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	FY 2001 Cost	FY 2001 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a. CMEP	PO		165	50						0	215	
b. ATEDS	C/CPFF		1256	765	31Mar99	579		585		0	3185	1754
c. ACDS	C/CPFF	Centech, Arlington VA	254	266		100				0	620	220
d. CANDID	SS/CPFF	Boeing, Mesa AZ	628	260		450		195		0	1533	750
e. AGPU Replacement	C/CPFF			584	31Mar99	500		585		0	1669	1500
f. ACHS	C/CPFF		911	216	31Mar99	316		325		0	1768	700
g. Corrosion Technologies	C/CPFF			243	31Mar99	519		684		1150	2596	2081
h. LOBDR	C/CPFF					292	31Mar00	450		1000	1742	1342
Subtotal Product Development:			3214	2384		2756		2824		2150	13328	8347

II. Support Costs: None

III. Test and Evaluation: None

IV. Management Services: None

Project Total Cost:			3214	2384		2756		2824		2150	13328	

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603801A Aviation - Advanced Development PROJECT DB45

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
DB45 Aircrew Integrated Systems - Advanced Development	9453	6428	0	0	2686	2693	2947	2943	Continuing	Continuing

A. <u>Mission Description and Budget Item Justification:</u> Project DB45 – Aircrew Integrated Systems (ACIS) Advanced Development: This project provides advanced development for those systems and items of equipment that are unique and necessary to the sustainment, survivability, and performance of Army aircrews and troops on the future integrated battlefield and related training missions. Advanced development programs will focus on the development and evaluation of emerging technologies and the adaptation of commercial and nondevelopmental items (NDI) to military requirements. The Air Warrior (AW) program will provide the aircrew with a systems approach to chemical and biological (CB) protection, noise protection, microclimatic conditioning, crash and post-crash survivability, concealment and environmental protection, ballistic protection, night vision capability, heads-up displays, nuclear flash protection, directed energy eye protection, and flame/heat protection. The AW design will improve overall aircrew mission performance, aircrew comfort, aircrew and aircrew station interface, safety, and survivability. The Aircrew Integrated Common Helmet (AICH) program (an Air Warrior program component) is the major information management, control, and aircraft interface for the aviator. The AICH incorporates a helmet mounted display, utilizing Comanche compatible optics and electronics with the advanced HGU-56/P helmet. The Virtual Retinal Display (VRD) development effort evaluates VRD technology for incorporation into helmet mounted displays of Army aircrews. The Virtual Cockpit Optimization Program (VCOP) demonstrates an integrated system providing pilots with improved intuitiveness, sense of awareness, overall aircrew mission performance, aircrew and aircrew station interface, safety, and survivability by providing the pilot with augmented visionics, three-dimensional audio improvements, and visual data regarding aircraft systems status and operation, threat warnings, and improved transition and training of pilots who must operate a number of different aircraft platforms during different missions. This project in this Program Element does not duplicate any aircraft platform program efforts. Both joint and service independent efforts continue to be pursued under the scope of this project.

FY 1998 Accomplishments:

•	9453	Continued Air Warrior Program Definition and Risk Reduction (PDRR) and incorporation of helmet mounted display technologies
Total	9453	

FY 1999 Planned Program:

•	2472	Complete basic Air Warrior PDRR effort, and begin studies of emerging technologies for insertion into the basic Air Warrior ensemble
•	3797	Begin Virtual Cockpit Optimization Program (VCOP) PDRR effort
•	159	Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs.
Total	6428	

FY 2000 Planned Program: Project not funded in FY 2000

FY 2001 Planned Program: Project not funded in FY 2001

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PE NUMBER AND TITLE: 0603801A Aviation - Advanced Development

PROJECT: DB45

B. Other Program Funding Summary	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Compl	Total Cost
RDTE, A Budget Activity 5 PE 0604801A Project DC45 (Aircrew Integrated Systems – EMD)	5402	11519	6312	9264	3687	2293	2587	2610	Cont	Cont
Aircraft Procurement, Army (APA) SSN AZ3110 Aircrew Integrated Systems which represents the Entire APA program for ACIS	7950	9024	4394	1419	21063	34511	57377	65637	Cont	Cont

C. Acquisition Strategy: DB45 – An Air Warrior Program Definition and Risk Reduction development contract was awarded in FY 97 to perform a functional requirements analysis and consider user requirements and available technologies to optimize recommended alternatives within the constraints of cost as an independent variable. A combined government and contractor team will then develop the Air Warrior systems and integrate those systems with the force modernization aircraft. Prototypes will be developed that represent the basic Air Warrior ensemble for test and evaluation. Through a combined government and contractor team, the Virtual Cockpit Optimization Program Definition and Risk Reduction effort will investigate and demonstrate how a future rotary wing crewstation could be crafted to deal effectively with information overload on the digital battlefield.

D. Schedule Profile	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Air Warrior Functional Analysis Review and Preferred Alternative selected			4Qtr							
Air Warrior Milestone II approved				1Qtr						
EMD for Air Warrior basic ensemble				4Qtr	4Qtr	4Qtr	2Qtr			
Development of Technical Insertion Plan				4Qtr						
Air Warrior Preliminary Design Review					1Qtr					
Critical Design Review and initial Prototype Development					3Qtr					
Air Warrior System Test (Development/Qualification)						1Qtr				
Initial Air Warrior Operation Test & Evaluation Complete						4Qtr				
Continuous evaluation, test and insertion of new technologies as Air Warrior product improvements						4Qtr	4Qtr	4Qtr	4Qtr	4Qtr
Air Warrior basic ensemble Milestone III							2Qtr			
Production of the basic Air Warrior ensemble during FY2002 through FY2008 for basic Air Warrior ensemble							4Qtr	4Qtr	4Qtr	4Qtr

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BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603801A Aviation - Advanced Development

PROJECT: DB45

D. Schedule Profile	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Air Warrior basic ensemble IOC								3Qtr		
Production of Air Warrior ensemble product improvements as emerging technologies can be inserted during FY 2003 through FY2012								4Qtr	4Qtr	4Qtr
Virtual Cockpit Optimization Program (VCOP) components demonstration in (APEX) simulator				4Qtr						

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